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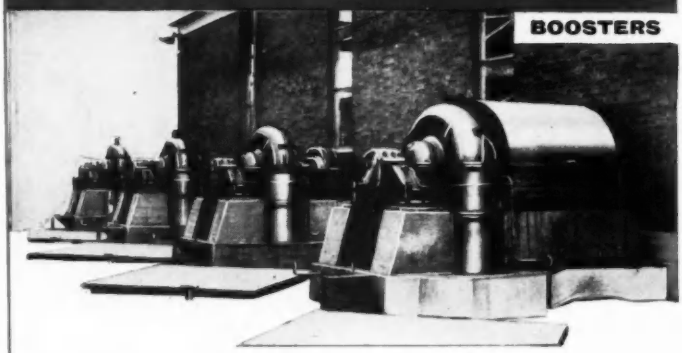

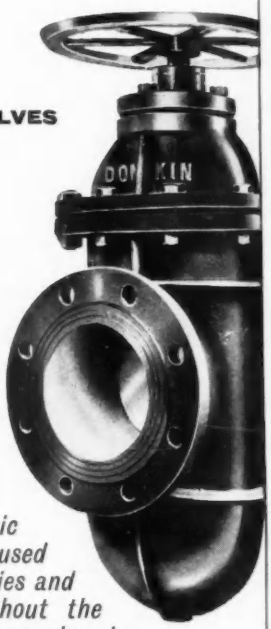

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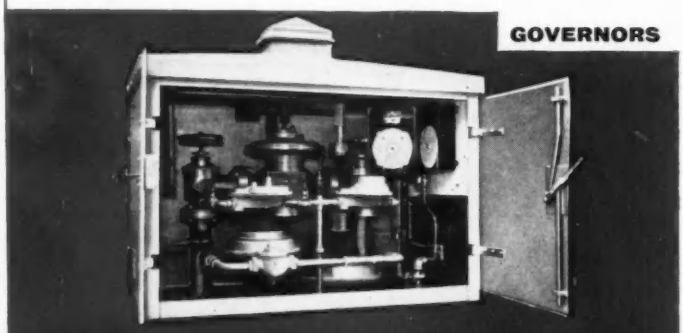

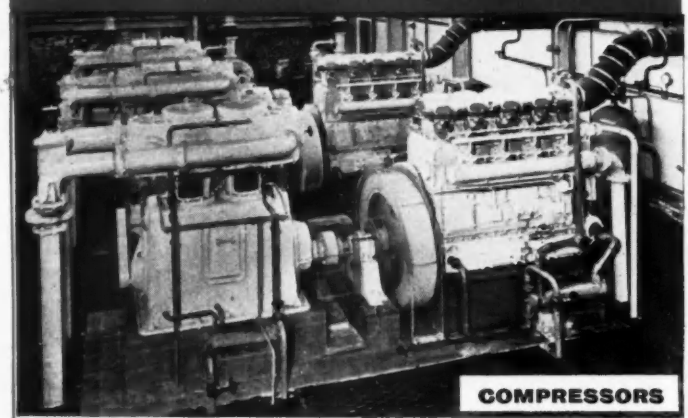

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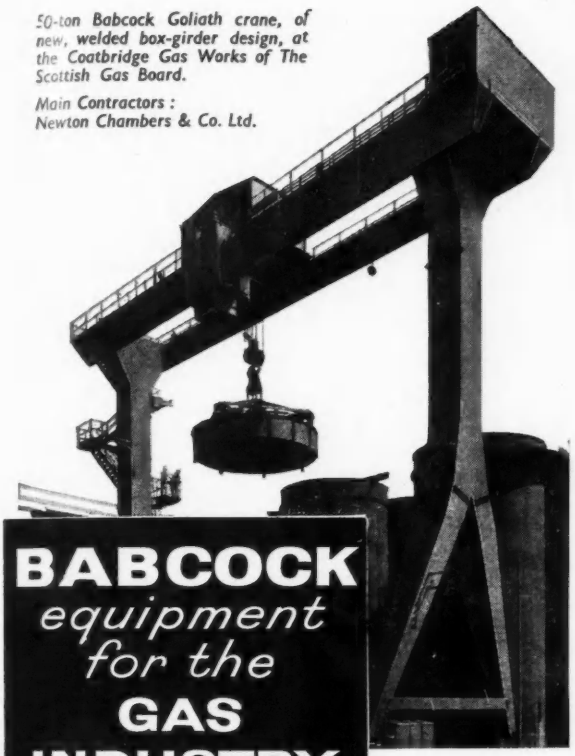

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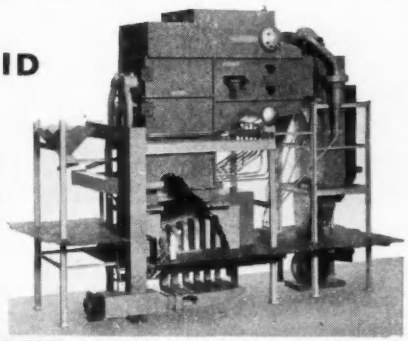

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Gas Journal

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WEDNESDAY, OCTOBER 5, 1960

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the study of movement

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Gas Journal

COKE OVENS • BY-PRODUCTS • CHEMICALS

Trends in coal tar distillation

TO the layman coal tar may be something of a mystery. It seems to take part in so many activities of the modern world and its products appear so unexpectedly. It is a little confusing for him to be told that tar makes excellent road surfaces, and that it is the source of a number of artificially produced chemicals covering substances ranging from dyestuffs to aspirin; that it is used as a fuel on a large scale in the steel industry, or that it is the starting point for the best possible wood preservatives.

The carbonising chemist is clearly well aware of all the wonders of the 'coal-tar tree,' but those engineers outside the immediate vicinity of the tar distillation works may well be glad of a refresher course to bring their knowledge up to date on the latest practice in plant design and the greatly increased scope of the products now being made available for the chemical manufacturing industry.

Appearing in our issue of last week, the paper by Mr. K. A. Adey, Chief Chemist of the Midland Tar Distillers Ltd., on the production of phenol and cresylic acid, served to introduce the whole subject of the potentialities of coal tar as a source of chemical raw material. Phenols and tar acids generally are a subject of some importance since in Mr. Adey's particular company alone some 350,000 tons of tar are distilled to give about 5.3 mill. gal. of refined tar acids annually.

This week we are going a step further and are publishing a paper on chemical engineering in tar works by Mr. B. E. A. Thomas, Chief Engineer of Chemical Engineering Wiltons Ltd., and Mr. J. G. D. Molinari, Manager of Proabd (England) Ltd. Since the authors are each connected with one of the most important firms for manufacturing chemical engineering equipment for the tar distillation industry in England and France respectively, it is natural that they should have described in detail some of the processes used by the by-products industry and the plant needed to carry them out.

The tendency in industry as a whole today is towards continuous processes, automatic control and the employment of the minimum amount of labour. It is not surprising, therefore, to find that a good deal of ingenuity has gone into designing continuous tar stills which can run for long periods with the least possible attention. For such stills to be practical and economic, they must be of high throughput and kept continuously running for long periods. This is only possible when the fullest possible use is made of centralised tar works, drawing their supplies from a number of sources in a surrounding area.

It is noticeable that although the idea of the continuous pipe still is by no means new—the Koppers Company of Essen had designed and marketed a successful plant more than 30 years ago—it was not until large groupings in the coke oven and gas industries made possible the idea of a large central works. The appearance of the co-operative tar distillery was a great step forward where the smaller gas undertaking was concerned. With the coming of the large, centralised tar works it was possible to sweep away the old-fashioned batch process pot still, together with its partner, the small coil still which served as a dehydrator and removed the light oil fraction from the crude tar.

The paper describes the two processes developed by each of the authors' firms in some detail, and we were struck by the difference between the underlying principles in each case. The Wilton plant, relying on the formation of a pitch of predetermined hardness to accomplish the dehydration of the crude tar, was, we thought, of some ingenuity. The authors' description of the details of the design of the pipe stills showed what care is needed to prevent overheating at vital points, and thus avoiding blockage which would eventually close down the plant. But it was the flexibility of the continuous still which we found most interesting. Broad or narrow cuts within quite fine limits were possible, and once the still had settled down to the new conditions, it would continue to produce to the fractions needed for long periods with little adjustment.

The demand for certain coal tar by-products is influenced by changes in the chemical industry outside the control of the tar distillers. An example of this is the greatly increased demand for naphthalene since the war. At one time this particular product was a drug on the market and there was little point in going beyond freeing it from the light oils with which it was associated. But with the increased use of phthalic anhydride as a raw material for plastics manufacture, good prices are obtainable for a naphthalene of high purity. The installation of the necessary plant to carry out the purification processes therefore becomes economic. Such purification plants employing more than one process are described by the authors. They also refer to the production of tar acids and point out that here again the demands of the plastics industry have increased the need for manufacturing pure tar acids for phenolic resins.

The choice of materials used for plant construction is naturally important, and this applies particularly to the storage of pure phenolic substances. The presence of iron tends to cause their discoloration so that stainless steel must be used for any tanks containing them.

The transport of chemicals in bulk is referred to and we were interested to see that naphthalene, for instance, is conveniently carried as a liquid in specially heated tankers; but here care must be exercised to avoid keeping it above a temperature of 100°C. for unduly long periods to prevent polymerisation. For export, naphthalene is crystalised as flake and packed in paper bags.

The production of pitch has always been something of a problem to the tar distiller, since it can cause difficulties in recovery from storage. In the past when demand was low, it was generally run into brick-lined bays to solidify into pools some 2 ft. deep. Great difficulty was often experienced in emptying these pools, and since explosive might have to be applied, the pitch as loaded might consist of anything between large 12-in. pieces and dust. Today pitch is produced as flakes or short pencils by water cooling methods. The increased demands by the electro-smelting industries for pitch for electrodes has made this change inevitable.

Reviewing this paper as a whole we are struck by the changes that are taking place in the design and lay-out of the modern tar refinery, and feel that chemical engineering practice has done much to keep the coal tar industry competitive with its giant rival, the petrochemical industry.

Commentary on the news

Confusion over H.P. terms

IN the past we have commented on the apparent reluctance of the gas industry to stick up for itself in the cut and thrust of the newspaper correspondence columns. Happily Mr. Therm has now found his tongue—or, rather, his pen—and gas is getting a reasonably fair deal. For example, a very damaging letter from a Mr. David L. Mainwaring Evans, which appeared in the *Daily Telegraph* last week, brought forth a rapid and conclusive reply from Mr. Wilfred Bailey, the Gas Council Secretary. To some extent, however, the damage had already been done, since it is always the accusation which sticks in the mind and not the rebuttal.

Mr. Mainwaring Evans took the gas industry to task for imposing a 12½% per annum hire purchase charge on a gas cooker over four years, against an 'almost universal' charge of 5%. He maintained that he then bought an identical model from a local store at 5% per annum.

In his reply Mr. Bailey pointed out that the 12% quoted by Mr. Mainwaring Evans, covering interest, administrative and other charges calculated on the outstanding balance, was equivalent to about 6½% if calculated by the flat rate method. Private firms offering hire-purchase terms usually quoted a flat rate of service charge which was applied for the number of years of the agreement to the whole amount due from the customer, less the initial deposit payable. The method used by gas boards calculated the hire purchase charges on the reducing balances remaining due from the customer after each monthly or quarterly payment had been made. For convenience, however, an equated monthly or quarterly repayment was quoted.

First aid on stage

THE tenth National First Aid Competition of the gas industry reached its final round last week, after eliminating contests had been carried out all over the country for some months past. The best men's teams from each of the 12 gas boards, and the best women's teams from eight of those boards took part in tests for the respective Challenge trophies, which resulted in a double win for Scotland.

It was very encouraging to see the enthusiasm with which the teams met the situation in hand. It is inevitable that as industry becomes more and more highly developed, there will be more and more situations that can give rise to accidents. However carefully any industrial unit may be organised, it can never be entirely safe for its workers, for wherever there is machinery there is an element of danger.

Without wishing to pile Pelion upon Ossa, the importance of first aid in any industry cannot be stressed enough; fortunately the gas industry is well aware of this fact, as is evidenced by the great enthusiasm with which the subject is approached by the area boards and their teams.

In his address before presenting the awards to the winning teams, Sir Henry Jones, Chairman of the Gas Council, made the point that first aid was nothing new to the gas industry. 'It is a great many years,' he said, 'since teams began to be trained in some undertakings.' 'In the industry now,' he continued, 'there are something like 4,500 people holding certificates in first aid.'

This highly encouraging figure could give rise to a certain degree of complacency, and it is without doubt very satisfactory. Yet there is always room for improvement in a matter such as this. There cannot be too many trained in first aid.

The teams that took part in the competition, including those which were eliminated in the earlier stages deserve the congratulations and appreciation of everyone in the industry; they have given up a great deal of their spare time in training and learning. Yet it is not all one-sided, for in watching the teams perform, one is drawn to the ineluctable conclusion that they enjoyed every part of their work.

Hare and tortoise and/or snail

WE have, in our long experience, encountered postal packets marked 'Damaged balloon ballast,' ditto, 'by salt water, bombs, enemy action'; more recently, in our service to the Institution of Gas Engineers, we have become familiar with neat annotations which in sum amount to the surprising fact that over 10% of the members of that august body are nomadic in their habits.

But today we are astonished to learn from a friend of the receipt of a large envelope neatly eroded around the edge and bearing the coolly impeccable Post Office apology 'Nibbled by snails.' Our mind flew (with distaste for the slimy English breed of escargot) to thousands of 'GAS JOURNALS' in transit, but took comfort in the realisation that snails like cold and dank surroundings, progress very slowly, and would find 'JOURNAL' news and views distinctly hot.

CHEMICALS AND BY-PRODUCTS

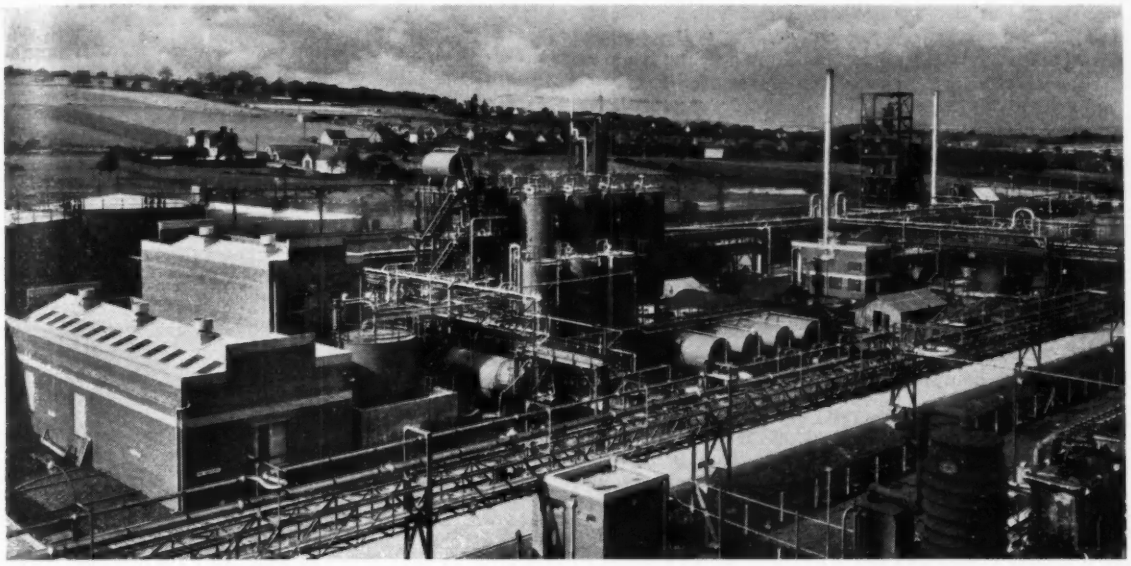


FIG. 1. *A complete N.C.B. tar works.*

The chemical engineering of tar works

By **B. E. A. THOMAS,**
A.M.I.Mech.E., A.M.I.Chem.E.
Chief Engineer, Chemical Engineering Wiltons Ltd.

and **J. G. D. MOLINARI,**
A.M.I.Mech.E., A.M.Inst.F., A.M.I.H.V.E.
Manager, Proabd (England) Ltd.

IN the early days of recovering organic chemicals from coal tar, distillation was almost the sole unit operation employed. Today, while distillation remains the main operation, others are becoming of increasing importance.

In recent years economic pressures have induced tar distillers to seek to increase their yield of certain products. Users of these products have found that better results in their processes can be obtained if the purity of the raw materials is higher. Consequently there is generally a redoubled effort to increase yield and to improve quality.

For economic production, operating costs have to be kept to a minimum. Apart from the cost of the raw material—crude tar—the first major item of prime cost in the running of a tar works is that of heat, and the second is labour for operating plants and for materials handling. Interest and depreciation on capital is the major item of oncost.

In order that the tar distiller may be able to meet his sales commitments at all times and thus to maintain favourable relations which his customers, it is important that his plant should be reliable. Furthermore, in order that he may fulfill the needs of a changing market it is necessary that tar works plants should be as flexible in operation as possible. Finally, and by no means least, tar works plant must be designed with the safety of the operating personnel in mind, and must cause no nuisance in the immediate neighbourhood of the works.

From the foregoing it will be seen that the following are the main principles on which tar works and their constituent plants must be designed:

1. To give a maximum yield of products of high market value.
2. To make products which will meet the rising quality standards.
3. To consume as little heat as possible.
4. To require the minimum of operating supervision and labour.
5. To be completely reliable at all times.
6. To be as flexible as possible.
7. To require the minimum of maintenance and that as simple and easy as possible.
8. To be completely safe in operation.
9. To cause no nuisance to the surrounding locality.
10. To be as low as possible in capital cost.

In present day practice the processing of crude tar begins with the removal of water and with primary distillation. The products of the primary distillation are then treated in a variety of ways to yield the final product.

The handling and treatment of the crude tar and subsequent products from its entry into the tar works to the

loading out of the final products will now be considered in detail.

According to the location of the tar works in relation to the source of supply of the raw material, the crude tar is received in various ways. Where the tar works is adjacent to a coke oven battery the crude tar may be pumped directly into the works storage tanks. Where the crude tar is received from a number of distant sources it may be conveyed to the tar works by road, rail or water borne transport. On arrival the tar is either pumped out or discharged into receiving troughs, from which it is then transferred by pump to the crude tar storage tanks.

In the storage tanks ammoniacal liquor separates on the top of the tar and is run off intermittently, either through a swing pipe, through side cocks, or through a siphon pipe. Sometimes the tanks are provided with closed tops, but unless it is desired to avoid dilution of the ammoniacal liquor there is probably very little point in providing a roof on the tank.

To facilitate pumping

Crude tar storage tanks are generally provided with steam, heating coils or pokers, which makes it possible to raise the temperature of viscous tars, such as those of coke oven origin, to facilitate pumping. In addition the application of heat is sometimes useful in breaking tar/water emulsions.

Dirt settles from the tar during storage and over a period a considerable quantity can build up inside a tank. Russell screens have been employed to remove suspended solids from crude tar before it is put into storage.

Crude tar is not usually a difficult material to pump and reciprocating or rotary positive pumps of all-iron construction are entirely satisfactory for this duty. Where the more viscous tars are being handled it is usually necessary to raise the temperature slightly above ambient in order to avoid an excessive pressure drop along the suction pipeline; cavitation may otherwise occur and the pump fail to deliver. Trouble may also be experienced with cavitation when pumping crude tar with high suction lift, and this can occur at a lower value of negative suction head than when pumping water. In order to minimise the effects of cavitation from these causes, it is advisable to install an oversize reciprocating pump running at slow speed to reduce the value of the acceleration head.

Separation of oils

The main object in all processes for the primary distillation of crude tar is the separation of the oils from the pitch. In current practice, fractionation equipment is usually included in the primary distillation plant to divide the oils into a number of convenient fractions for sale and for subsequent processing. In many plants the oil vapours driven off in the distillation are passed up a single fractionating column. Reflux is provided by condensing the overhead vapours. Products are taken off as a bleed from the overhead and at sidestreams at various points in the column.

Generally no oil is returned from the base of the fractionating column to the distillation process and there is, therefore, no reboil. With this method of operation the reflux ratios vary considerably over the column. At the head of the column it is very high and at the base it is very low, so consequently the efficiency of fractionation is good at the top but poor at the base. No more heat is required than in a distillation process without a fractionating column, and the fractions obtained have in the most cases in the past been of acceptable quality. Superior fractionation in the lower part of the fractionating column may be obtained by recycling oil from the base of the column to the distillation part of the process, thus providing reboil.

Recently there has been a movement to increase the recovery of naphthalene from crude tar, and to attain this as much naphthalene as possible must be gathered from the crude tar and concentrated efficiently into an oil of high crystallising point. While some improvement is possible by increasing the degree of fractionation in the primary distillation plant, optimum results are obtained by taking at the primary distillation a broadly cut oil fraction which contains substantially all the naphthalene in the crude tar. The naphthalene is subsequently removed from this fraction in further processes, giving a material of high crystallising point in good yield. These subsequent processes are described in detail later in this article.

Most crude tar is distilled today in continuous pipe still plants. In fact, the pipe still had been used for many years for the distillation of crude tar, long before its employment in petroleum distillation. The advantages of continuous pipe still distillation are: (*a*) Higher oil yield, (*b*) reduced fire risk, (*c*) lower fuel costs, (*d*) lower operating labour requirements, (*e*) reduced maintenance costs, and (*f*) better and more uniform oil fractions.

Coal tars, particularly those produced from the lower carbonising processes, are heat sensitive, so pipe stills for continuous tar distillation have to be designed to keep the tube wall temperatures to a minimum and avoid local hot spots. There are two basic types of pipe still design:

1. Those employing essentially convective heat transfer on the gas side.
2. Those employing radiant and convective heat transfer on the gas side.

Convective pipe still

In the convective type the temperature of the gases entering the pipe still tube bank is reduced sufficiently to avoid excessively high tube wall temperatures. This may be achieved by the admission of large amounts of excess air into the pipe still combustion chamber; this however, considerably increases the fuel consumption. To improve fuel consumption the temperature of the gases entering the tube bank may be reduced by dilution of the hot combustion gases with flue gases recirculated from the outlet of the pipe still. This also increases the volume of gas in circulation and thereby generally improves heat transfer on the gas side by the increased gas velocity. Heat transfer in the convective tube bank may also be improved on the gas side by the use of tubes with extended surfaces over part or all of the tube bank.

In the radiant/convective design, tubes are provided within the combustion chamber where they are subjected to direct and reflected radiation arising from the combustion of the fuel. The design of this type of pipe still requires especial care, since incorrect design results in local overheating and consequent troubles caused by coking in the tubes. It is important to provide in the design adequate surface for absorption of heat in the radiant section to ensure that the rate of heat transfer is not excessively high. Furthermore it is important to reduce the temperature sufficiently of the gases leaving the combustion chamber and entering the convective tube bank so as not to cause excessively high tube wall temperatures at that point. The position of the radiant heating surfaces in relation to the source of radiant heat should be such that the rate of heat transfer is as uniform as possible, though higher rates of heat transfer should be allowed at those surfaces at or near the tar inlets than those at the tar outlets.

The liquid flow conditions within the pipe still tubes themselves are also important, since they affect the ten-

dency to over-heating and coke formation. The resistance to heat transfer on the liquid side may increase considerably under certain conditions of mixed liquid and vapour flow. Where this occurs it is important to avoid excessively high temperature conditions on the gas side which would result in a high temperature on the internal surface of the tube, with consequent coking.

Having considered some of the major factors affecting the design of continuous tar distillation plant, two typical systems, which have reached a high stage of development, are described below.

In the Proabd system, Fig. 2, the crude tar as received is pumped through vapour and oil heat exchangers in series and through a final bank of tubes, which forms an economiser section to the pipe still, into a dehydrator. Sufficient waste heat is recovered by these means to raise the temperature of the tar substantially above the boiling point of water and the resulting water vapour is released in a dehydration vessel together with a small amount of the lightest volatile fractions. A steam heater is incorporated in the circuit to enable the initial dehydration to be carried out when starting the plant from cold.

The water and light oils vapours are condensed in a vapour/crude tar heat exchanger and a backing condenser, and are then separated by continuous decantation. The light oils may be returned to the tar in the dehydrator or, in the case of a light tar, pumped directly to the appropriate tray in the fractionating column.

Dehydrated tar from the dehydrator is pumped at a constant controlled rate by a reciprocating pump through a pitch heat exchanger into the pipe still.

In order to maintain a constant feed of dehydrated tar to match the regular flow through the pipe still the delivery of the crude tar pump is controlled by the level of tar in the dehydrator.

To prevent excessive vaporisation in the pipe still and to prevent critical heat transfer conditions arising, the pressure of the tar at the outlet is controlled by an adjustable expansion valve. The outlet of this valve is connected directly into the flash chamber or distillation column where the volatile fractions released from the hot tar are separated from the residual pitch. The pitch is further stripped by the injection of steam which is superheated in a section of the pipe still.

Pitch is discharged from the flash chamber through a constant level float operated valve, through the pitch heat exchangers and thence to the pitch beds or blending plant.

The vapours from the flash chamber pass into the fractionating column where they are separated into the required primary fractions which pass through the overhead vapour and side-stream oil heat exchangers previously mentioned in the description of the crude tar circuit. The side-stream products may then be passed through water coolers to reduce their temperatures for easy handling.

The overhead vapours, after partial condensation in the heat exchanger, pass through a backing condenser and the resulting benzole/water mixture is decanted.

Crude benzole from the decanter is pumped back to the top of the column as reflux and the product is taken off through a branch in this reflux line. A float valve in the benzole compartment of the decanter controls the rate of

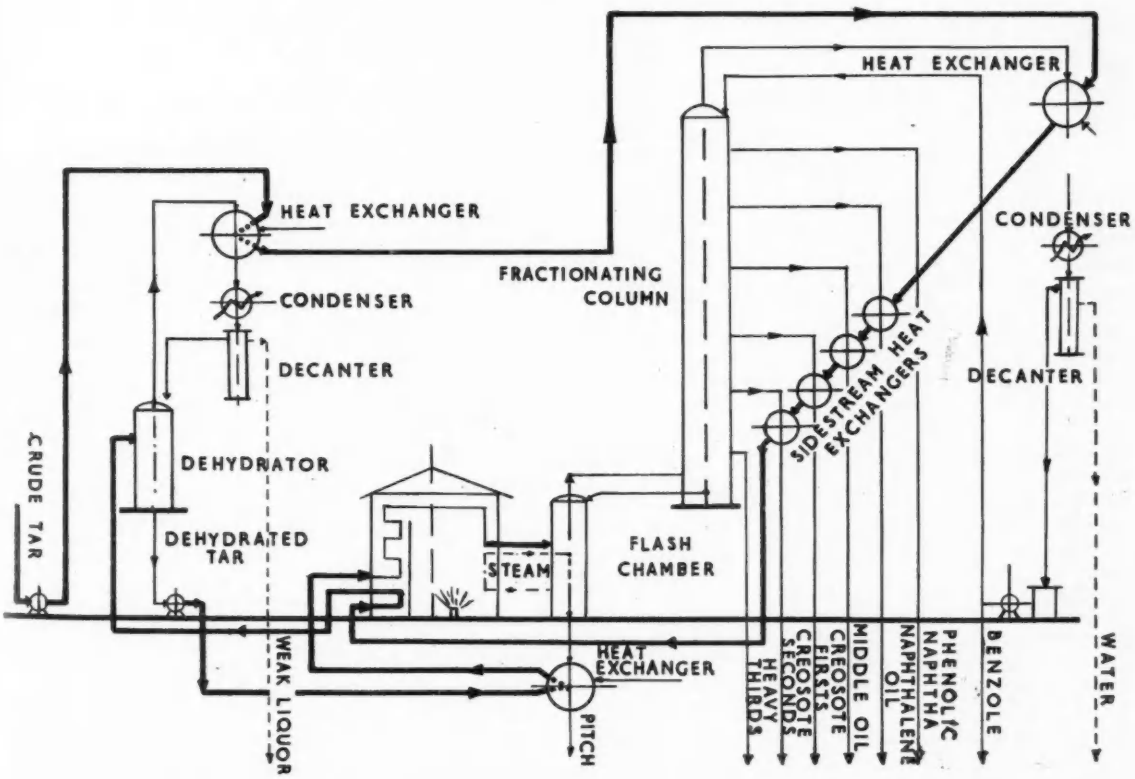


FIG. 2. *Flow diagram of the Proabd process tar distillation plant.*

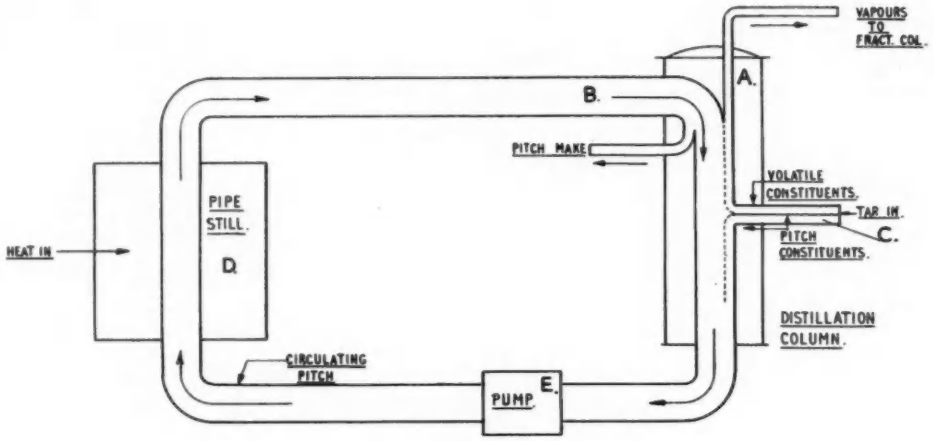


FIG. 3. *Flow diagram illustrating the principles of the Wilton tar distillation process.*

pumping. The draw-off of benzole and side-stream products is controlled by a needle valve and a rotameter in each stream. It has been proved in practice that, with a constant dehydrated tar flow, steady furnace conditions which are maintained thermostatically, and the correct settings on the various product flows, such a plant will run for many days without any adjustment at all and that variations in crude tar composition or product requirements can very quickly be dealt with.

Pitch recirculation

The Wilton system uses the principle of pitch recirculation and, while this system employs a pipe still, a substantial proportion of the crude tar does not enter the pipe still but is vaporised by direct contact with a stream of hot pitch which is circulated through it. Fig. 3 shows a schematic arrangement of the Wilton system of distillation. The crude tar, which is normally preheated through various heat exchangers, enters the distillation column where it meets a stream of hot circulating pitch. The water, together with the more volatile part of the crude tar, vaporises. The less volatile part joins the stream of circulating pitch and is pumped through the pipe still (D) by the pump (E). On leaving the pipe still at (B) the heated pitch returns to the top of the distillation column (A) where the remainder of the oil in the tar is vaporised. The pitch then descends the distillation column, a portion being withdrawn as pitch product. The quantity of this pitch product removed from the system is continuously replaced by the pitch content of the entering tar, thus maintaining a constant supply of pitch in circulation through the pipe still.

Fig. 4 shows a typical flow diagram of a Wilton tar distillation plant. Crude tar from storage tanks is fed through one of two static filters, either of which can be switched out of circuit for cleaning when required. It then passes to the crude tar feed pumps one of which is a standby. These pumps are automatically controlled so as to maintain a constant pre-determined flow of tar through the system. The tar is then preheated by passing through three heat exchangers: (*a*) A vapour/tar heat exchanger, (*b*) a pipe still economiser, and (*c*) a pitch/tar heat exchanger.

Each of these heat exchangers has by-pass pipework and valves so that it can be drained and serviced while the plant is on load. If all the pumps are steam driven and if the tar is abnormally cold it may be advantageous also to incorporate a steam/tar heat exchanger. The exact system of heat exchange employed depends on such factors as the capacity of the plant and the value of the fuel.

The distillation column consists internally of a series of trays over which the pitch and tar cascade. Hot pitch from the pipe still enters through the pitch inlet and cascades into the steaming section where the injection of superheated steam establishes the required pitch hardness and strips the pitch of the higher boiling volatile oils. These pass upwards in the vapour phase with the steam to the vapour outlet. Pitch from the steaming section overflows through a downtake pipe on to further trays where it meets the preheated tar entering through the tar inlet. Pitch and tar cascade together in a thin layer over the trays so that the tar is volatilised by the heat in the pitch, the resulting vapours passing upwards through a series of pitch curtains into the steaming section and thence to the vapour outlet.

The pitch, now partially cooled and containing the heavier oils from the tar, flows to the bottom of the column and passes to the pitch circulating pumps which deliver equal quantities to the two circuits of the pipe still. One of the pumps is a standby. In order to keep the circulating pumps fed with liquid, the amount of pitch bled from the system as product is regulated by a valve which is operated by a pitch level controller in the bottom section of the distillation column. The product pitch bled from the distillation column passes through the pitch/tar heat exchanger where it is cooled.

Overhead product

The volatile tar constituents pass to the fractionating column. The column shown produces an overhead product, three side-stream products and a residue oil fraction. If a larger number of fractions is required a column with a greater number of bubble cap trays is employed.

The vapour from the fractionating column passes through the vapour/tar heat exchanger to the condenser. The condensate flows to the separator from which the water passes to drain and the oils to the reflux tank, the non-condensible gases leaving through a foul gas scrubber irrigated with water before being burned in the pipe still.

The oil in the reflux tank is returned to the head of the fractionating column by pump. The flow of reflux delivered by the pump is controlled automatically by the temperature at a selected point near the top of the fractionating

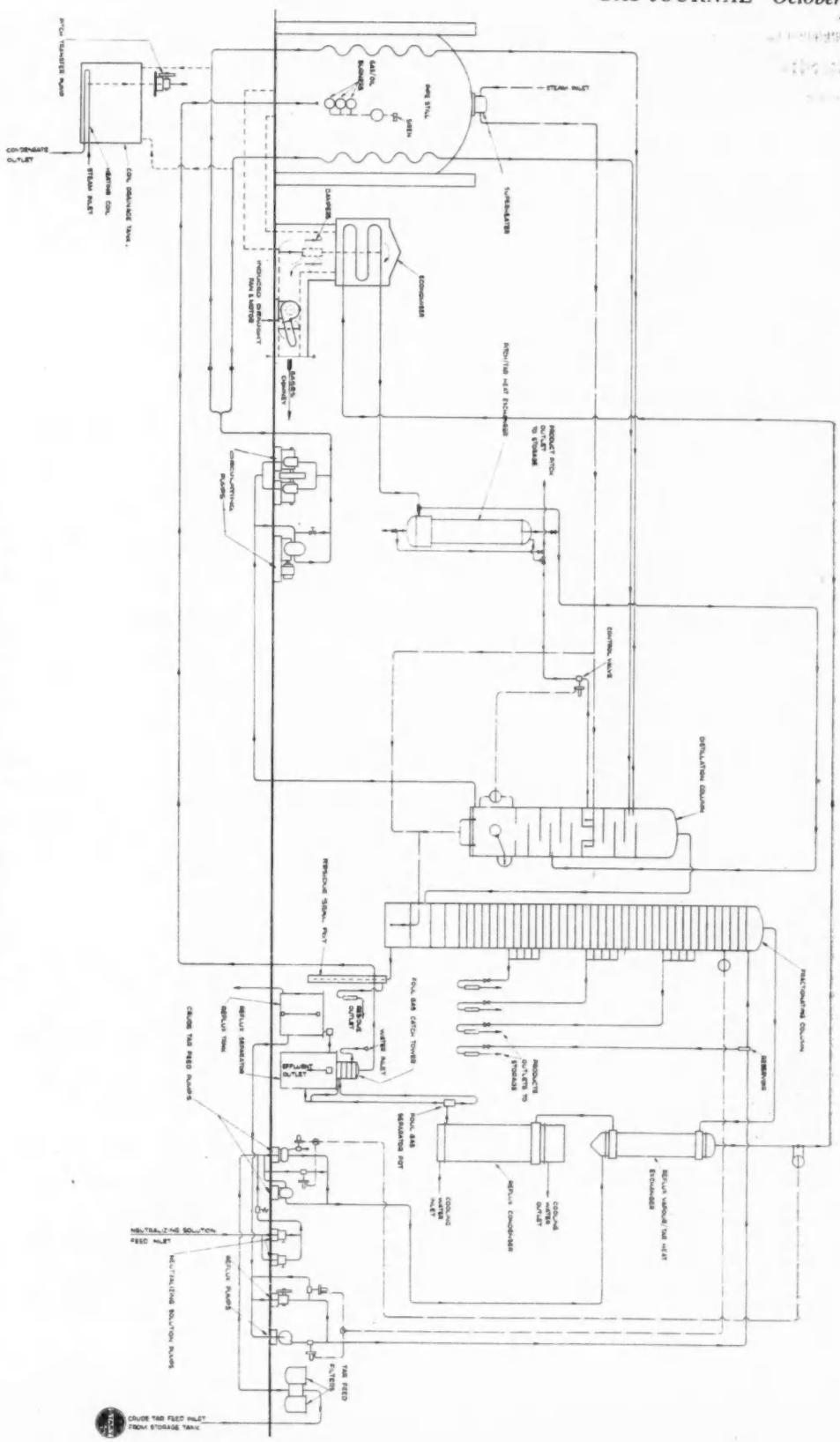


FIG. 4. *Flow diagram of the Wilton tar distillation plant.*

CHEMICALS AND BY-PRODUCTS

column so that the temperature distribution throughout the column is kept stable and constant.

Means for regulating and measuring the flows of overhead and side-stream products are the same as provided in the Proabd system. Coolers for the various side-stream products may be incorporated.

In the Wilton system of distillation separate dehydration of the crude tar is not normally incorporated. However, where it is desired to reduce the size of the fractionating equipment (as in very large plants), dehydration of the crude tar may be included. This is achieved in a separate section of the distillation column where the preheated crude tar mixes with a stream of hot pitch bled from the pipe still outlet. The quantity of pitch bleed is automatically regulated by the temperature of the dehydrated tar leaving the mixing chamber. The vapours from this chamber pass to a condenser. The condensate then flows to a separator from which the light oil is returned to the crude tar feed to the plant.

Where steam pumps are employed, in either of the systems of primary tar distillation described above, the exhaust steam may be passed through the superheater and used in the distillation to carry out the final stripping of the pitch.

Although not shown on either of the flow diagrams, means may be provided in either system of distillation for the recycling of residue oil from the base of the fractionating column to the inlet side of the pipe still, so as to provide reboil and to improve fractionation in the lower part of the fractionating column.

The products from the primary tar distillation plant usually consist of a selection of the following: (*a*) Light oil, (*b*) the naphtha fraction, (*c*) carbolic oil, (*d*) naphthalene oil, (*e*) wash oil, (*f*) creosote oil, (*g*) anthracene oil, (*h*) residue oil, sometimes also known as 'base' oil or 'Chrysene' oil and (*i*) base tar or pitch.

Usually some of these products are combined and sometimes they are further sub-divided into light and heavy fractions, according to the nature of the crude tar feedstock and to meet local market requirements.

The further treatment of the products of the primary distillation will now be described.

The light oil produced in the distillation of the crude tar is usually consigned to a benzole refining plant. Often this plant may be dealing in the main with benzole extracted from gas, but in some large tar works, which are not on the same site as the coal carbonising plant, a benzole refining plant may be installed specially to deal with the light oil recovered from the coal tar alone.

The operations in the refining of crude benzole have been well described in previous articles. In this field also the trend is towards greater yields of products of better quality. This applies particularly to benzene, the demand for which as a starting point for production of organic chemicals such as phenol and maleic anhydride is increasing. There is a tendency for the required crystallising point of the benzene product to increase and for the allowable content of sulphur as thiophene to decrease. Where the inherent paraffin content of the benzene is such that a high crystallising point of product cannot be obtained by the normal techniques of fractional distillation, additional means such as azeotropic distillation or crystallising processes will have to be employed. Where a very low sulphur content as thiophene is required in the benzene product the orthodox methods of batch acid washing are not adequate. One method which has proved successful in achieving very low thiophene sulphur content has been the process developed by the Dutch State Mines. This employs counter-current washing of the benzene with concentrated sulphuric acid in a pulse column. With this process it is possible to reduce the sulphur content of the benzene as thiophene to 1 mg. per kg., or even less if required. The quantity of sulphuric acid used is much less than in conventional acid washing processes.

Coumarone and indene resins are polymers of coumarone and indene which are found in the light oil and carbolic oil fractions of the crude tar. They are used in the manufacture of thermo-plastic flooring tiles and to a lesser extent in rubber compounding, and recently in the manufacture of some pharmaceuticals.

The coumarone and indene are first concentrated in a monomer-rich naphtha. This stage usually includes a wash with B.O.V. to eliminate impurities such as styrene. Polymerisation of the coumarone and indene is then achieved by means of a catalyst. This process is carried out batchwise in a stirred reaction vessel fitted with heating and cooling coils. After the vessel has been charged with feedstock the contents are first heated to a temperature of about 35°C. and a measured quantity of catalyst is added. The reaction, which is exothermic, commences immediately and the temperature rises rapidly. Water cooling is employed to limit the temperature to between 90 and 100°C. More catalyst is fed in continuously until a predetermined amount has been added. The reaction is completed in about one hour.

The solution of polymer in naphtha is then washed with sodium carbonate solution following which the washed material is steam distilled for an extended period. During this distillation, the later stages of which are carried out under vacuum without steam injection, the naphtha is driven off and recovered. The resin remaining in the still is discharged and allowed to solidify, after which it is crushed and bagged for despatch.

Valuable components

Some of the more valuable components of coal tar are the tar acids. The most important are phenol and the cresols: Ortho-, meta- and para-. These are valuable starting materials for synthesis of organic chemicals and for plastics manufacture. To a lesser extent they are used in disinfectants and antiseptics. Other tar acids of less simple form and of higher boiling points are used principally in the manufacture of disinfectants, pharmaceuticals and trixylenyl phosphate.

The useful tar acids are concentrated principally in the naphthalene and carbolic oil fractions obtained in the primary distillation of the tar. The crude tar acids are extracted from these oils by washing with caustic soda. The resulting cresylate is usually 'sprung' by contacting it with a carbon dioxide containing gas. The products of the reaction are the tar acids and an aqueous solution of sodium carbonate. These two liquids are separated and the sodium carbonate is usually re-causticised with burnt lime in preference to purchasing fresh caustic soda. The carbon dioxide containing gas should have a carbon dioxide content of at least 10% and preferably higher. Therefore it is common practice to use flue gases from boiler or pipe still furnaces for this purpose. In larger installations it is common practice to install a lime kiln for the production of the burnt lime and the gases from this kiln, which are rich

in carbon dioxide (often around 34%) are used in the springing of the cresylate.

In earlier times refined tar acid products were made by a process of selective washing followed by batch distillation. With the rise in demand by the plastics industry for phenols for the production of phenolic resins, continuous distillation processes for production of refined tar acids began to be employed. A continuous process of this kind is described below, and consists of the following stages:

1. Dehydration of the crude tar acid.
2. Depitching.
3. Distillation in a multi-column plant to yield (a) phenol, (b) o-cresol, (c) m- and p-cresol, and (d) xylenols/high boiling tar acids.

It is usual to carry out the distillations under vacuum using steam at a minimum supply pressure of 200 p.s.i.g. for the reboiler heating medium.

The crude tar acids usually contain 12 to 16% water. This is removed in the dehydration unit under moderate vacuum. The unit consists of a short stripping column with reboiler, condenser and decanter. The water is taken off overhead and brings with it its azeotropic complement of phenol. The overhead condensate is decanted, the phenol returning to crude tar acid feed and the aqueous solution of phenol is usually sent back to the tar acid extraction plant. The dehydrated crude tar acid leaves the base of the column, from which it is delivered to the depitching unit.

Residual sulphur elimination

While it is not essential to depitch the crude tar acids before distillation commences, it is desirable to do so in the interests of eliminating residual sulphur bearing materials, which if left in, may lead to dissolved hydrogen sulphide in the final products with consequent spoiling of odour. The depitching operation is a simple stripping process in which all the volatile material is distilled off and condensed, leaving a medium soft residual pitch. This pitch is usually disposed of either by burning or dumping. If it is consigned to crude tar it can act as a tar/water emulsion stabiliser and if blended with coal tar fuels there is a danger of sludge deposition in the blended fuel storage tanks.

A variation on the system of depitching of the crude tar acid is one in which the lower boiling tar acids are first stripped out and in a second stage the high boiling tar acids are removed from the pitch.

The dehydrated, depitched crude tar acids are then fed continuously into a battery of three columns arranged in series, each column being equipped with a reboiler and condenser. Phenol, o-cresol, and m- and p-cresol are taken off as overhead products, and a xylenol high boiling tar acids mixture is discharged as a residue product from the last column. The phenol product may be obtained directly in commercially pure quality in this way, provided the column from which it is taken has a sufficient number of plates and the operating reflux is adequate. Where products of high purity are being made on the first two columns of a plant of this type it may be necessary to provide means for the removal from the system of thiophenol.

Further purification

For the further purification of the refined tar acid products batch stills with rectifying columns and condensers are employed. These are also heated by steam and operate under vacuum. Where final refining of high boiling tar acids is required a simple batch still without a rectifying column is used.

It will be noted that meta- and para-cresol, whose boiling points are only .32°C. apart, cannot be separated commercially by fractional distillation.

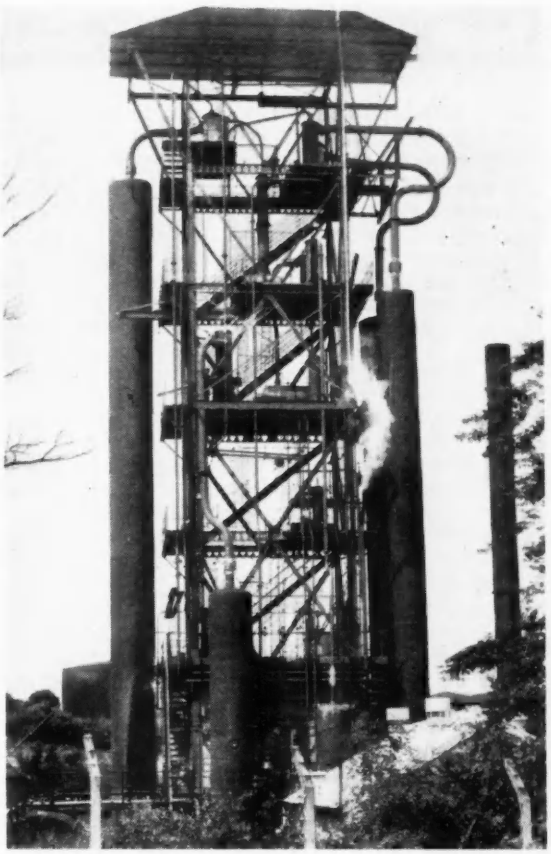


FIG. 5. *A Proabd tar acid refining plant.*
(By permission of the Scottish Tar Distillers, Ltd.)

Owing to the corrosive nature of tar acids, particularly near their boiling points, a careful choice of resistant materials has to be made for the various components of the refining plant. Parts of the plant used for the handling and storage of pure products should be of stainless steel construction.

Due to the highly necrotic nature of phenols it is particularly important in the interests of preventing accidents that all parts of the plant should be capable of being drained easily and as completely as possible.

With the increasing demand in recent years for phthalic anhydride the recovery of the naphthalene available in crude tar has become of increasing importance. Primary separation of crude naphthalene from a naphthalene oil fraction of the tar was traditionally carried out by allowing the oil to cool in open pans. The naphthalene crystallised out of solution and the remaining oil was then allowed to drain out of the pan leaving solid naphthalene, which still contained up to 20% of oil.

The naphthalene recovered in this way may be refined by hot pressing. In this method drained naphthalene obtained from either pan crystallisation or simple centrifuging, as described later, is warmed and charged between steel plates in the heated cylinder of a powerful hydraulic press. When pressure is applied the oil remaining in the naphthalene is squeezed out through the perforated walls of the cylinder and the remaining naphthalene cake which usually has a crystallising point above 78° C. is discharged from the press.

CHEMICALS AND BY-PRODUCTS

Over the years various methods of improving the yield and quality of naphthalene have been developed and today the manufacturer has a wide choice of processes.

Where it is applicable, the most straightforward and efficient process is direct distillation. One plant of this type on the Continent is regularly producing better than 79° C. crystallising point material—98% purity—in yields of up to 98%. In view of the comparatively high boiling point of naphthalene—218° C.—the most efficient method of heating has been found to be that of a direct fired pipe still. Where the throughput justifies, continuous distillation has obvious advantages in operation, consistency of product and yield. However, direct distillation to a final product is only applicable to oil from a highly aromatic tar, low in sulphur and with tar acids almost completely removed. The presence of tar acids, organic sulphur compounds and other impurities boiling in the same range as naphthalene can interfere with the distillation sufficiently to preclude a high yield of high quality product. In some cases the contaminants may completely prevent attainment of a high crystallising point product.

An entirely different approach is that of crystallisation and centrifuging. The naphthalene rich oil is cooled in water-cooled agitated vessels which may also have a means of scraping the inside cooling surface to maintain a satisfactory rate of heat transfer. Such crystallisers have been developed to produce a naphthalene crystal slurry which can be fed to centrifuges in which the solid naphthalene crystals are separated from the residual drained oil. Provided that the crystallisation has been carefully controlled such direct centrifuging will produce a naphthalene cake with a crystallising point of about 76° C. (92% pure). Various methods of washing the cake while it is being centrifuged have been developed and it is possible by such means to raise the crystallising point to between 78 and 78.5°C. The material obtained in this way is saleable for phthalic anhydride manufacture.

A further process—the 'Butler process—employs solvent extraction by methanol of drained naphthalene crystals which have been formed in a special type of static crystalliser. The drained crystals are given two washes: The first wash is by 'once-used' methanol; the second wash is by pure methanol. After the washes have been drained off the naphthalene is melted, heated to drive off residual methanol and then discharged from the crystalliser as phthalic grade naphthalene. The used methanol is recovered from its contaminating oil by distillation.

Naphthalene separation

All processes involving the separation of solid naphthalene from the associated oil, result in a drained oil which is saturated with naphthalene at the temperature to which it has been cooled in the process of crystallisation. The quantity of naphthalene which is soluble in the drained oil even at 0°C. is quite considerable. Therefore it is important, in order to secure a higher recovery of naphthalene in a process of this type, to ensure that the quantity of drained oil is as small as possible. On the other hand, to gather as much naphthalene as possible from the crude tar, it is necessary to take a broadly cut oil fraction. If this broadly cut fraction were crystallised, the quantity of resulting drained oil and hence naphthalene losses would be considerable. The most satisfactory solution to this problem so far devised is the concentration of this fraction into a smaller naphthalene-rich fraction by distillation; it is generally advisable to remove the tar acids from it before the distillation step. In some cases, where the distillation characteristics of the feedstock oil are very good, it is possible to produce phthalic-grade naphthalene in high yield from the broadly cut feedstock by distillation alone. In other cases it is necessary to follow the distillation by another process employing crystallisation in order to produce the required crystallising point-product in good yield.

It has occurred to many people, when considering the combination of distillation and separation by crystallisation that the drained oil could be re-distilled to recover naphthalene. Caution must be exercised when considering such a solution since if a closed distillation cycle is formed, compounds distilling close to naphthalene and present normally in very small quantities, may very quickly be concentrated and completely prevent the production of a high grade product.

An interesting and attractive method of upgrading a semi-refined naphthalene to produce a phthalic-grade or nearly pure product has recently been developed in France. Two installations employing this process are already satisfactorily in operation in this country and others are in course of construction. The laboratory technique of zone melting by which crystallisable material can be separated from impurities is now well known but has not generally been used on an industrial scale except for a very few special applications.

Upgrading of naphthalene

The Proabd Refiner process (Patent pending) broadly applies the same physical principle to the purification of naphthalene on a large scale without the use of equipment with moving parts, or the necessity for concentrating heat in a single zone. The process is most applicable to the upgrading of naphthalene with a crystallising point between 72 and 76°C. to that having a crystallising point of between 78 and 79.5°C. The process employs crystallisation and re-melting of the semi-refined naphthalene charge in a special type of apparatus. The impurities are removed in a naphthalene-rich oil which is returned to an earlier part of the process for recovery of the naphthalene.

All the methods described above can be used in various combinations for the production of naphthalene suitable for the manufacture of phthalic anhydride. For the production of pure white crystal grade naphthalene, such as is sold on the domestic market, further refining, including washing with sulphuric acid, is necessary.

The users of naphthalene currently prefer to accept the material in bulk liquid form and specify the temperature at which it must be loaded into their insulated road or rail tankers to ensure that it is still liquid when it is received at their works. The producers therefore have to provide bulk storage of liquid naphthalene in heated insulated tanks and this is a much safer method of storage than the traditional one of storing solid naphthalene in bags which presents a considerable fire hazard. However, care must be taken that the naphthalene is not kept at a temperature above 100°C. longer than necessary since on prolonged heating some polymerisation of residual impurities can take place and produce troublesome sludge.

Naphthalene is shipped overseas in the solid form and where it is produced as a liquid, it can most conveniently be solidified in roll flaking machine. The flake is then loaded as quickly as possible into paper or hessian bags for shipment. If it is kept in hoppers or bins for an extended period the flakes stick together and the whole mass requires considerable labour to free it.

For the storage of most tar works products mild steel tanks are perfectly satisfactory. It is, however, necessary to provide stainless steel tanks for the storage of pure phenol in order to avoid its discoloration by iron contamination. All product tanks should be fitted with steam heating coils or pokers for the purpose of either melting up crystallised material or for reducing the viscosity to aid pumping during handling. It is desirable that large bulk product storage tanks should be fitted with a swiag pipe so that liquid may be drawn off at various levels. It is sometimes not realised that liquids run into a large tank at different intervals often do not mix properly and it may be necessary to provide means for gently agitating the tank contents to ensure homogeneity. One method of doing this is by jet mixing, using one of the product transfer pumps for this purpose.

All-iron centrifugal pumps have been found to be very satisfactory for the transfer and loading of tar works' oil products. Reciprocating pumps have also been used for this purpose but are generally more expensive to install, run and maintain.

For the transfer and loading of refined tars, reciprocating pumps, both steam and electrically driven, and rotary positive pumps of all-iron construction, have been employed successfully. The rotary positive pumps may be of the internal bearing type provided the conditions are such that film type lubrication obtains in the bearings. For this to occur the delivery pressure must not be too high and the viscosity of the liquid being pumped must not be too low. Outside these conditions it is necessary for the rotary positive pump to have external bearings, though if this type is employed and the pressure across the pump is high, the pump shafts must be sufficiently stiff to prevent excessive deflection due to bending which results in gland leakage troubles.

Heating pipelines

Opinions on the extent and method of heating pipelines conveying crystallisable liquids or refined tars and pitches vary considerably. If the pipeline is of sufficiently large diameter, material can solidify on the pipe wall and provide a form of lagging without completely obstructing the pipe bore. Under these circumstances, provided the initial temperature of the liquid being handled is sufficiently high and the pipeline is purged out after pumping with a low melting point liquid, it is possible to transfer solidifiable materials over considerable distances in pipelines which are not equipped with any external form of heating or insulation. However, this method has its limitations and can lead to wastage of material and contamination of products. Generally, for the transfer of products which solidify above about 30°C. pipelines should be heated and lagged. The selection of the form of pipe-line heating for each particular case requires experience, since it is necessary to consider not only the crystallising point of the liquid being handled, but also the bore of the pipeline, whether part or all of it must at times stand full, and the initial temperature of the liquid on entry into the pipe. For the easiest duties a simple form of steam tracing may be employed.

At the other end of the scale the pipeline should be fully jacketed and heated by high pressure steam. Recently, heat conducting compositions have been introduced from the United States and these can be employed in conjunction with steam tracing frequently with advantage. This material is also useful where it is not possible to jacket the pipeline right up to the connecting flanges. In some cases it is possible to clear the delivery line of liquid while the suction pipe cannot be completely voided. Under these conditions, where the solidifying point of the liquid is not too high, the best solution may sometimes be to steam jacket the suction pipe but only to steam trace the delivery line.

Where steam is employed for purging pipelines care should be taken to prevent as far as possible the admission of water into storage tanks. If possible, permanent steam purging connections on pipelines should be avoided. Where such connections have to be used double valving should always be employed.

In laying out the pipework for product storage the following principles should be borne in mind:

1. The layout should be easy for the pump man to learn and use.
2. Product contamination should be minimised—the degree of importance of this varies with the purity of the product.
3. Bottle necks at junctions should be avoided as far as possible.
4. Commensurate with the above, the number of separate pipelines should not be more than necessary. More lines mean not only greater initial cost but also increased maintenance cost, operational complexity, and for steam heated lines, greater fuel costs.
5. As far as possible pipelines should be arranged so that they will not stand full on completion of a transfer operation.

In modern installations for the production of refined tars the blending of the tars is usually carried out in vertical cylindrical vessels fitted with a side-entry propeller stirrer. This type of blending equipment makes it possible to mix a batch in about one hour or less after charging the blending tank. It is convenient to add the base tar to the blending tank by gravity; it is also convenient to add the cut-back oils to the blending tank in this way, though if necessary the tanks may be situated at low level and the oils transfered by pumping. It is recommended that the temperature of the contents of a cut-back oil tank be maintained above about 110°C. in order to eliminate water being run into the blending tank with consequent frothing over of the contents.

Multiple storage

Since it may be necessary to provide for loading out several grades of refined tar at any time, multiple storage for these grades should usually be provided. A good arrangement is to place these tanks at such a level that loading into lorries or rail tanks may be by gravity.

When refined tar is used for spraying roads it is usually necessary to make provision for the reception of returned loads due to changes in weather conditions etc. In such cases it is often useful to have one or two batch stills on the tar works which are retained solely for the purpose of reheating returned tars.

In the past in this country medium soft and hard pitches have been run into large bays and allowed to cool under atmospherical conditions. Subsequently, the pitch has been won by the use of a combination of manual and mechanical methods, often aided by explosives. The pitch recovered from the cooling bays in this way varies in size between about 12 in. and dust. The content of fines is usually fairly

considerable. There is now a movement towards the production of a more uniform and more easily handleable pitch product. With this in view plants for the water cooling of pitch have been installed at a number of tar works in this country. In one process pitch is formed as flakes and in another as short pencils.

With the steady growth in aluminium production the demand for special pitches for use as binders in making electrodes for aluminium reduction furnaces is increasing. In the past these pitches have been made from selected raw materials in batch pot stills, but the production of such pitches from a wider range of raw materials by continuous processes is now at the development stage.

In most tar works it is possible to utilise steam at several pressures. So that in a large works the production of steam at high pressure and electricity generated by a pass-out or back-pressure turbine becomes economic. Other steam driven prime movers in the tar works, such as the pumps on the primary tar distillation plant, can be arranged to exhaust into a back pressure main, as already described earlier in this article. In addition, considerable quantities of steam can be saved by the recovery of flash steam from condensate discharged by steam traps. Steam can be employed quite usefully at pressures of 10 to 15 p.s.i.g. provided the pipe diameters, particularly those on rising mains, are generously sized and especial attention is given to condensate drainage and air venting. Finally, even flash steam at atmospheric pressure can be used to heat circulating water for space heating.

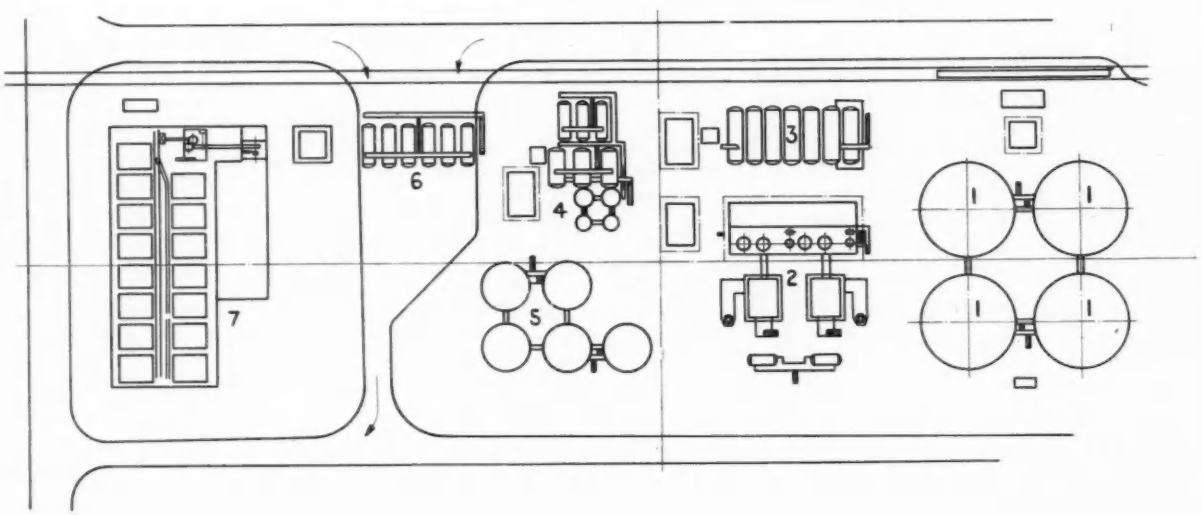
Usually the amount of land available for the tar works and also its shape are determined by external factors; the works has to be fitted into the site and space available. In laying out a tar works the following main principles should be observed:

1. The layout should suit the main flow of materials with a bias towards the shortening of pipelines handling liquids which solidify easily.
2. Plants using or producing solid materials should be near the unloading or loading points for those materials.
3. As far as possible the centroids of services consumption should be near to the sources of supply.
4. Plants and storages should be grouped so as to reduce walking distances for operators.
5. It must be possible to remove equipment or certain parts of equipment for maintenance purposes.
6. Where possible fire breaks should be left between individual process units and storage areas. This requires especial attention on sites which are sloping.
7. Adequate space should be provided for road transport vehicles so that when vehicles are being loaded access ways are not obstructed. Where possible a through or circuit road or lay-by should be provided so that road vehicles do not have to back into position under loading points.
8. Wherever possible there should be some provision for future expansion both in process plant and storage areas.

Fig. 6 shows the layout of a typical tar works. The crude tar storage tanks are located at the right hand end of the works where they are convenient for the source of supply. The primary tar distillation plant is situated next to the crude tar tanks. The products from this plant flow to the daily product oil tanks and to the tar blending plant which are conveniently placed. Oils and pitch creosote mixture are transferred to the adjacent bulk storage tanks and road tars are delivered into the overhead road loading tanks, situated above a circuit road which is increased in width in the area of the loading tanks. The naphthalene plant is located on the left hand side of the circuit road and oils are transferred to and from this plant from the bulk storage tanks.

It has not been possible within the compass of this article to deal with the detailed chemical engineering design of the unit plants comprising a complete tar works. Nevertheless, it is hoped that the review of the main processes given in this article and the setting out of the essential principles guiding the design, layout, and construction of the works and its component parts will provide a useful outline of the applications of chemical engineering in this particular field.

FIG. 6. *Layout of the tar works at Durgapur steel works.*



WALES BOARD EXTENDS GRID

THE linking of the Mid-Wales gas grid with the North Wales grid would play a leading part in attracting new industries to Montgomeryshire and Radnorshire, said Mr. Mervyn Jones, the Chairman of the Wales Gas Board, when he announced at Cardiff that the opening ceremony of the new grid would be performed by Sir Harry Pilkington on October 18 at Llwyn Gwilym, near Rhayadar.

The smaller undertakings in towns linked by the grid will not now be limited to resources from their own plants, most of which, said Mr. Jones, were built in the last century and were now very old-fashioned. 'The coming of this grid will mean that, with the arrival of a new factory, we can cope with gas requirements without any difficulty at all.'

Most of the work on the scheme has been done over the last four or five months. It is intended to extend the grid, which covers 83 miles, to Cardigan Bay and later to areas on the North-West coast. Mr. Jones said that gas for industrial purposes had increased by 150% since the inception of the Wales Gas Board 11 years ago. There were now about 720 miles of grid mains throughout Wales.

Sir Henry Jones presents the trophies

Sir Henry Jones, Chairman of the Gas Council, presents the cup for the women's competition (above) to Miss C. W. Combe, the captain of the Scottish Gas Board's team. Mr. D. Pearson, the captain of the Scottish men's team, receives the Challenge Trophy (below).

NEWS SUPPLEMENT

SCOTS WIN BOTH TROPHIES IN GAS FIRST AID FINAL

A SCOTTISH double . . . . that was the result of the gas industry's annual National First Aid Competition, at the finals of which both the men's and women's Challenge Trophies were won by the teams of the Scottish Gas Board.

The competition, which was held under the auspices of the St. John Ambulance Association, had its final round at Friends' House, London.

Men's results

In the men's competition, the winning Scottish team gained 307 points out of a possible 400. The West Midlands Gas Board team came second, with 301 points, and the East Midlands Gas Board team was third with 295½.

In the women's team competition, the Scottish Gas Board again gained first place, with 320 out of 400 points. The Eastern Gas Board team was second with 295½ points, and the team from the North Western Gas Board was a close third with 294 points.

They go on

Both Scottish teams will now go on to represent the gas industry in the Grand Prior's Trophy Competitions, which will be held on November 17, when the opposition will be from winning teams of other National Final Competitions.

Londonderry raises gas charges

THE price of gas in Londonderry has gone up for the first time since 1957. In making this announcement, the Londonderry Gaslight Company gave the reason as the recent increase in coal prices.

The increased gas prices took effect on October 1, being 5d. per thousand cu.ft. higher. An official of the Gaslight Company said this would mean the average household consumer would have to pay 9s. to 10s. per year more for his gas, which was approximately 2½d. per week extra.

Bonus scheme plea

THE application of an incentive bonus in appliance installation in order to reduce costs, will be suggested to the North Eastern Gas Board. The resolution to do so was passed, in spite of some opposition, by the North Eastern Gas Consultative Council. Concern was expressed at the increased competition from oil, and the possibility of higher coal prices placing strain on the industry's competitive position. The Board was also urged to seek economies before raising the price of gas in response to the coal increase.

Companies rush for natural gas rights in British Columbia

JULY saw 127 companies place bids totalling $3,247,925, for oil and natural gas rights in the north east corner of British Columbia.

The land involved was 274,000 acres, in 32 parcels, north of Fort Nelson in the general area of Kotcho Lake, where the biggest natural gas wells yet discovered in North America have been found.

One of the firms interested was Shell Oil of Canada, which secured a permit covering 48,549 acres in the Liard River Basin. British American Oil secured a reservation on 24,473 acres, while other bids were from Mobil Oil of Canada, and Phillips Petroleum Co.

To obtain these rights, companies must undertake a specified amount of drilling, otherwise the land reverts to the Crown. It is stated that the field could supply the requirements of the whole of Canada. It is proposed to pipe natural gas from the Fort Nelson area down to the coast, thence by undersea pipeline to Vancouver Island.

Gas Trunk Line of British Columbia Ltd. has just started work on a 245-mile international gas pipeline system, extending from the vicinity of Fort Nelson to Chetwynd, where it will join the already operating Westcoast Transmission Pipeline. The new pipeline will be of 30 in. diameter pipe and will, it is estimated, cost more than $90 mill.

Minister visits the Southern Gas Board

THE Minister of Power, Mr. Richard Wood, visited the Southern Gas Board, after a tour of the Esso Oil Refinery at Fawley, nr. Southampton. He was accompanied by Mr. J. Angus Beckett, Under Secretary of the Gas Division of the Ministry, and Mr. Hubert Scholes, his Private Secretary.

He discussed gas production and distribution with the Board Chairman, Mr. C. H. Leach; the Deputy Chairman, Mr. A. F. Hetherington; and Dr. A. E. Haffner, Chief Engineer and Board Member.

The party visited Southampton gas works where the Minister saw the Onia Gegi sets and purifiers.

He thus saw the whole picture of refinery gas from the refinery to the point where it is converted into town gas.

Mr. Wood also visited the coal wharf, adjacent to the works, where considerable

In the Winchester Road offices of the Southern Gas Board the Minister of Power, Mr. Richard Wood, discusses Customer Accounting. From left to right Mr. W. Carter, Section Leader; Mr. C. H. Leach, Chairman; the Minister, and Mr. W. Hyde. Chief Accountant.

improvements have been carried out, and administrative offices at Winchester Road, Southampton.

In the evening the Chairman, and the Deputy Chairman, with Mr. J. Jones and Mr. A. E. Smith, Board Members, dined with the Minister and his party, and the Board's Senior Officers.

The Minister said he could see a hard fight ahead for the gas industry and thought the next few years could see some changes in the look of the industry, but he was certain that competition between gas and electricity must be to the ultimate benefit of the customer.

STILL TOPS

Chelmsford gasworks has won the Eastern Gas Board's trophy for the best kept gasworks in the area for the second year in succession.

German News Letter

THE consumption of gas in August 1960 was 6% more than in the same month of the previous year. At Frankfurt the rise was 12%, at Nuremberg 11% and at Osnabrück 16%.

Natural gas output

The output of natural gas in the German Federal Republic was 213 mill. cu.m. in the first half of 1960. Nearly 65 mill. cu.m. came from the area between the rivers Weser and Ems in Northern Germany, 51 mill. cu.m. being produced in Bavaria.

Liquid gas production

The output of liquid gas was 377,831 tons, and of refinery gas 390,000 tons in the first six months of 1960; 63,000 tons of liquid gas were exported, and 261,000 tons were consumed in Western Germany. Only 1,843 tons were imported. Foreign firms were very interested in the German liquid gas market.

New wells for natural gas

In the next three years it is planned to sink wells to a depth of 3 to 4,000 m. in Northern and Southern Germany in search of natural gas. Then further borings will be made to a depth of 6,000 m., concentrating on the Bavarian frontier.

Cities make joint probe

Some of the larger cities of Western Germany are jointly investigating which natural gas can be used for household and industrial consumption. The cities of Cologne, Düsseldorf, Duisburg, Krefeld and Bielefeld are already members of this association.

First natural gas station

The first of its kind in Western Germany, a power station based on natural gas is planned by the Preussische Elektrizitätgesellschaft, Hanover.

A serious competitor

German experts declare that natural gas is becoming a serious competitor to coal, especially because it is lower in price. But it would also compete with crude oil, because plants can be converted from coal directly to natural gas.

Old soldiers get new flag

A NEW standard was dedicated last week for Belfast Corporation Gas Department ex-Servicemen's Association, which has 300 members. The standard, a Union Jack, was presented to the Association by its President, Mr. J. L. Hyslop, who is to retire soon from the Department after almost 20 years as engineer and manager. The Department has had an ex-Servicemen's Association since the end of the first World War.

Retort house fire threat

FIREMEN fought a blaze 80 ft. up inside the retort house at the Spenborough works of the North Eastern Gas Board at Moorend, Cleckheaton. For a time there was a threat of an explosion as 20 tons of coke in hoppers inside the retort house was involved.

The blaze spread to timber boards on the top sectional floor of the 90 ft. high building, and firemen were handicapped when an electrically-operated internal lift failed and they had to climb 80 ft. A Board official said he did not anticipate interference with production.

B.I.M. conference

THE 15th National Conference of the British Institute of Management is being held at Harrogate from October 11 to 13. A wide range of topics of current interest and concern to British Management will be examined and discussion will range from 'Pay Differentials', 'The Restrictive Trades Practices Act', and 'Training of Young Workers', to 'The Movement of Industry', and 'Automation and the Older Worker'. In addition to the papers given, there will be a show of some recent industrial films.

THEIR FIRST IRISH TALKS

THE first Purchasing Officers' Association regional conference to be held in Ireland takes place at Belfast Castle on Saturday, October 29, 1960.

After the formal opening of the conference by the Lord Mayor of Belfast, Alderman R. G. C. Kinahan, there will be an address on 'Finance and Economics of Purchasing' by Dr. W. McCornish, Senior Lecturer, Commerce Department, Belfast College of Technology.

The second session will be on purchasing organisation and will be given by Mr. J. M. Grammer, Director General of Purchasing and Stores, National Coal Board and the National Vice-Chairman of the Association.

Further details may be obtained from The Secretary, Purchasing Officers' Association, Wardrobe Court, 146A, Queen Victoria Street, London, E.C.4.

FEWER ACCIDENTS

Fewer employees of the North Western Gas Board are being involved in accidents. The Crewe Rotary Club heard this encouraging statement from Mr. H. G. Hall, who is Chief Safety Officer for the Board. He said that the number of accidents had fallen by more than half in the last ten years.

Gas showhouses prove popular in South West

FOR some time the South Western Gas Board has been co-operating with developers of private estates in opening showhouses to the public. This has been taken one stage further by the development of the Board's own showhouse programme. Under this scheme the Board purchases a property in the building stage in a new development, and opens it to the public when completed, so that they may inspect the gas-fired central heating system.

Local furnishing firms and decorators co-operate, as do landscape gardeners, so that the house or bungalow is furnished down to the last detail.

Many visitors have inspected systems installed in houses or bungalows in various parts of the area.

The sales from April 1 to August 14 of boilers for central heating and hot water are more than 250% up on results for the corresponding period of last year, while warm air heater disposals show an increase of 70%.

At the opening of the South Western Gas Board's show bungalow at Saltford, nr. Bath, the Chairman of the Board, Mr. C. H. Chester, bastes a chicken on the barbecue grill of the new cooker. On the left are: Mr. L. A. Smith (builder), Councillor F. H. Crofts (Chairman of Keynsham U.D.C.), who officially opened the bungalow, and Mrs. Crofts. Right is Miss Cynthia Smith, Home Service Adviser, Bristol.

So far properties have been on view at Barnstable, Gloucester, Yeovil, Saltford, near Bath, and Bristol. The immediate programme includes properties in the Plymouth, Cheltenham, Swindon and Taunton districts, with possible extension to other districts in the forthcoming year.

In addition to gas whole-house heating systems by hot water or warmed air, these properties contain, of course, a range of other gas appliances of the latest design and are attractively decorated and furnished.

Private developers of new estates in the South West are also opening showhouses incorporating gas central heating, and here the Board co-operates fully and supports any advertising appearing in local papers.

Showhouses form part of the Board's large-scale central heating campaign, which has just been re-started.

JOINT COMMITTEE ON STRESS ANALYSIS

FOLLOWING an exploratory meeting on March 1, 1960, arranged by the Institute of Physics, a Joint British Committee for Stress Analysis has been set up.

This committee will represent the interests of Great Britain in the field of Stress Analysis at the periodic meetings of the Permanent Committee which are held in Europe and will thus ensure adequate British participation in international conferences on stress analysis.

The principal object of the Permanent Committee, membership of which is open to all West European countries, is the furtherance of international collaboration on stress analysis; in seeking to achieve this end, international conferences will be arranged at four-yearly intervals.

CORRESPONDENCE

HOUSE HEATING

Dear Sir,

Mr. W. H. Johnson, in his article 'The fifth column in the small bore war' ('GAS JOURNAL,' p. 355, Sept. 7), appears to have struck a new note, and incidentally an extremely important one, in this new phase of 'small house heating,' where householders are being persuaded to purchase heating installations, off the peg, with very little or no consideration for the client's personal and exacting requirements.

Heating installations cannot be sold and installed like a television set, where the client is limited to a choice of three or four sizes of screen, the possibilities in both design and technique are so numerous, there can be no short cut to a course to guide any ambitious salesman, or back street plumber, who is anxious to jump onto the band wagon.

That very old saying comes to mind, 'a little knowledge can be an extremely dangerous thing,' and this could be very true in the case under review, the possibilities of a boom in small heating and air conditioning units, that has been apparent in the United States of America over the past ten or 20 years, will be lost in this country through, as Mr. Johnson describes, 'ill fitting and shoddy units.'

The first and most important approach to whole house heating is insulation to the structure of the building, this in itself is a specialist job, and one that in my opinion is not receiving the serious consideration it warrants, the cost is so small compared with the annual saving in fuel, but perhaps only a heating engineer could be expected to appreciate this very important point.

The first cost of insulation is the last, but unfortunately the annual fuel bill has the habit of cropping up year after year.

Comparisons of fuel costs are beginning to appear at regular intervals, and in all cases gas as a fuel is placed very low on these lists, being the most costly after electricity. The importance of this is clearly indicated in the recent Wilson report, which draws attention to the link and future survival of both the gas and coal industries, and spotlights the changing pattern over the past 40 years, where fluctuations in fuel costs have been in the main the determining factor in deciding the type of plant to be installed.

W. H. ROGERS, M.I.H.V.E.

Caprera,
Melville Street,
Sandown, I.O.W.

September 15, 1960.

Clean air meeting

OVER 900 members and delegates will be attending the 27th conference of the National Society for Clean Air, to be held at Harrogate from October 5 to 7. An exhibition will show all the principal means for securing both clean air and fuel efficiency, covering the problem in industry, in the home and on the roads. One of the most important features of the conference will be the presentation and discussion of reports from over 1,000 local authorities on how the Clean Air Act is working. The conference and exhibition will be opened by Sir Keith Joseph, M.P., Parliamentary Secretary to the Ministry of Housing and Local Government.

COMING EVENTS

October 7.—LONDON AND SOUTHERN JUNIORS: The Assembly Hall, Westminster Technical College, Vincent Square, S.W.1. Business and General Meeting, followed by Presidential Address: 'Some recent developments and problems at Bromley-by-Bow Works.' 6.30 p.m.

October 12.—LONDON AND SOUTHERN JUNIORS: Visit to Canvey Island Liquid Methane Project of the North Thames Gas Board. 2 p.m.

October 13.—I.G.E. EASTERN SECTION: Annual General Meeting. Visit to the Peterborough Works of A.E.I. Hotpoint Limited, Celta Road, Old Fletton, Peterborough. 2.30 p.m.

October 13.—I.G.E., WALES AND MONMOUTHSHIRE SECTION: Gas Showrooms, Swansea. Annual General Meeting. 10.30 a.m.

October 13.—THE SOCIETY OF INSTRUMENT TECHNOLOGY, CONTROL SECTION: Manson House, 26, Portland Place, London, W.1. 'Transistor Switches in Monitor and Control Systems,' by W. A. Ross. 6.30 p.m.

October 15. — WESTERN JUNIORS: Demonstration Theatre, South Western Gas Board, Bridge Street, Taunton. Annual General Meeting. 2.30 p.m.

October 15. — MANCHESTER JUNIORS: Rochdale Road Gas Works, Manchester. Annual General Meeting and President's Day. 2.15 p.m.

October 17.—EASTERN G.C.C.: Connaught Rooms, Great Queen Street, Kingsway, W.C.2. 11 a.m.

October 18.—THE COMBUSTION ENGINEERING ASSOCIATION, SOUTHERN REGION: The Criterion Restaurant, Piccadilly Circus, W.1. Discussion on 'British Standard 1017 Part 1: Sampling of Coal,' by R. C. Tomlinson. 10.30 a.m.

October 18. — I.G.E., LONDON AND SOUTHERN SECTION: Caxton Hall, Caxton Street, Westminster, S.W.1. Annual General Meeting, followed by a paper on 'Forecasts: Domestic Gas and Appliance Sales,' by J. A. Buckley. 2.45 p.m.

October 19.—I.G.E., SOUTH WESTERN SECTION, BRISTOL: Annual General Meeting and Address by the Chairman.

PERSONAL NOTES

MR. C. J. PHILLIPS, works superintendent, Southampton, has retired after 43 years' service with the former Southampton Gas Undertaking and the Southern Gas Board. He became an articled pupil at the Southampton Gas Works in 1917 and, except for a few months in the following year when he served in the R.F.C., has remained there. He was successively works chemist, chief chemist, works assistant, works superintendent in 1942, and assistant engineer in 1948. In 1945, Mr. Phillips became an Associate Member of the Institution of Gas Engineers. After the industry was nationalised he was assistant engineer of the Southampton Group and subsequently assistant engineer and general manager. In 1956 he took up his final position as works superintendent at Southampton.

MR. J. C. HOGG has been appointed Station Engineer at Southampton gasworks. He will also be concerned with other engineering developments in the Southampton region. MR. J. R. FAIRMAN has been appointed Assistant Station Engineer; he was formerly assistant to the works superintendent, Mr. C. J. Phillips, who has now retired (see above).

MR. JAMES M. DOW, of Edinburgh, has been appointed Engineer and Manager of the Belfast Gas Department at a salary of £3,150 rising to £3,550. He will succeed MR. J. L. HYSLOP, who has held the post for almost 20 years, and is now retiring. Mr. Dow is a member of the Institution of Gas Engineers and of the Institute of British Engineers. He has held positions of divisional controller and group manager under the Scottish Board, and was engineer and manager of Paisley's gas department. He is at present coal and by-products officer with the Scottish Gas Board.

SIR JOHN WRIGHTSON, BT., Chairman of Head Wrightson & Co. Ltd., has been invited to attend the annual dinner of the Council of British Manufacturers of Petroleum Equipment on October 5, as their principal guest and speaker.

MR. JOHN AITKEN, engineer and manager of Carlisle gasworks since 1939, has retired due to ill-health. Mr. Aitken had served at Carlisle gasworks for the past 30 years.

COUNCILLOR G. HALL, of Bishop's Waltham, Hants., has been appointed a member of the Southern Gas Consultative Council by the Minister of Power.

MR. H. L. WILSON of Whitehaven, Cumberland, has been appointed a member of the Northern Gas Consultative Council by the Minister of Power.

MR. LESLIE HARDERN has been appointed Chairman of the Food Education Society in succession to DR. FRANKLIN BICKNELL.